

The listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently Amended) A laser irradiation apparatus comprising:
a first laser oscillator generating a first pulsed laser beam having a wavelength of visible light or a shorter wavelength than that of visible light;
means for controlling a shape and a position of a beam spot of the first laser beam;
a plurality of second laser oscillators each generating a second continuous wave laser beam of a solid laser, the second continuous wave laser beam has a fundamental wave;
a plurality of means for controlling a shape and a position of a beam spot of the respective second laser beam to overlap with the beam spot of the first laser beam, each of the plurality of means functioning such that a portion of the beam spot of the first laser beam and an entire portion of the respective beam spots of the second laser beams are overlapped with each other; and
means for controlling a relative position of the beam spot of the first laser beam and the beam spot of the second laser beam to the processing object;
~~wherein a portion of the beam spot of the first laser beam and an entire portion of a plurality of beam spots of the second laser beams are overlapped with each other.~~
2. (Original) A laser irradiation apparatus according to claim 1,
wherein the first laser beam has a wavelength of second harmonic.
3. (Canceled)

4. (Original) A laser irradiation apparatus according to claim 1,
wherein the beam spot of the first laser beam is elliptical, rectangular, or linear.
5. (Original) A laser irradiation apparatus according to claim 1,
wherein the beam spot of the second laser beam is elliptical, rectangular, or linear.
6. (Original) A laser irradiation apparatus according to claim 1,
wherein the first laser oscillator is selected from the group consisting of an Ar laser, a Kr laser, an excimer laser, a CO₂ laser, a YAG laser, a Y₂O₃ laser, a YVO₄ laser, a YLF laser, a YAlO₃ laser, a glass laser, a ruby laser, an alexandrite laser, a Ti: sapphire laser, a copper vapor laser, and a gold vapor laser.
7. (Previously Presented) A laser irradiation apparatus according to claim 1,
wherein the second laser oscillator is selected from the group consisting of a YAG laser, a Y₂O₃ laser, a YVO₄ laser, a YLF laser, a YAlO₃ laser, an alexandrite laser, and a Ti: sapphire laser.
8. (Original) A laser irradiation apparatus according to claim 1,
wherein:
the processing object comprises a substrate having a thickness of "d" which is transparent to the first laser beam; and
an incident angle " $\Phi 1$ " of the first laser beam to a surface of the processing object satisfies an inequality of $\Phi 1 \geq \arctan (W1/2d)$ when W1 is defined as a length of a major axis or a minor axis of the beam spot of the first laser beam.
9. (Original) A laser irradiation apparatus according to claim 1,
wherein:

the processing object comprises a substrate having a thickness of "d" which is transparent to the second laser beam; and

an incident angle " Φ_2 " of the second laser beam to a surface of the processing object satisfies an inequality of $\Phi_2 \geq \arctan(W_2/2d)$ when W_2 is defined as a length of a major axis or a minor axis of the beam spot of the second laser beam.

10. (Currently Amended) A laser irradiation apparatus comprising:

a first laser oscillator generating a first pulsed laser beam having a wavelength of visible light or a shorter wavelength than that of visible light;

means for controlling a shape and a position of a beam spot of the first laser beam;

a second laser oscillator generating a second continuous wave laser beam of a solid laser, the second continuous wave laser beam has a fundamental wave;

means for controlling a shape and a position of a beam spot of the second laser beam to overlap with the beam spot of the first laser beam, the means functioning such that the beam spot of the first laser beam is larger than that of the second laser beam;

and

means for controlling a relative position of the beam spot of the first laser beam and the beam spot of the second laser beam to a processing object;

~~wherein the beam spot of the first laser beam is larger than that of the second laser beam.~~

11. (Previously Presented) A laser irradiation apparatus according to claim 10, wherein the first laser beam has a wavelength of second harmonic.

12. (Canceled)

13. (Previously Presented) A laser irradiation apparatus according to claim 10,

wherein the beam spot of the first laser beam is elliptical, rectangular, or linear.

14. (Previously Presented) A laser irradiation apparatus according to claim 10, wherein the beam spot of the second laser beam is elliptical, rectangular, or linear.

15. (Previously Presented) A laser irradiation apparatus according to claim 10, wherein the first laser oscillator is selected from the group consisting of an Ar laser, a Kr laser, an excimer laser, a CO₂ laser, a YAG laser, a Y₂O₃ laser, a YVO₄ laser, a YLF laser, a YAlO₃ laser, a glass laser, a ruby laser, an alexandrite laser, a Ti: sapphire laser, a copper vapor laser, and a gold vapor laser.

16. (Previously Presented) A laser irradiation apparatus according to claim 10, wherein the second laser oscillator is selected from the group consisting of a YAG laser, a Y₂O₃ laser, a YVO₄ laser, a YLF laser, a YAlO₃ laser, an alexandrite laser, and a Ti: sapphire laser.

17. (Previously Presented) A laser irradiation apparatus according to claim 10, wherein:
the processing object comprises a substrate having a thickness of "d" which is transparent to the first laser beam; and
an incident angle " Φ_1 " of the first laser beam to a surface of the processing object satisfies an inequality of $\Phi_1 \geq \arctan(W_1/2d)$ when W₁ is defined as a length of a major axis or a minor axis of the beam spot of the first laser beam.

18. (Previously Presented) A laser irradiation apparatus according to claim 10, wherein:

the processing object comprises a substrate having a thickness of "d" which is transparent to the second laser beam; and

an incident angle " Φ_2 " of the second laser beam to a surface of the processing object satisfies an inequality of $\Phi_2 \geq \arctan(W_2/2d)$ when W_2 is defined as a length of a major axis or a minor axis of the beam spot of the second laser beam.

19. (Previously Presented) A laser irradiation method comprising the step of:
irradiating a processing object with a first pulsed laser beam having a wavelength of visible light or a shorter wavelength than that of visible light and a plurality of second continuous wave laser beams of solid lasers, each of the plurality of second continuous wave laser beams has a fundamental wave,

wherein when the processing object is irradiated with the first laser beam and the plurality of second laser beams, a portion of a first beam spot formed on a surface of the processing object by the first laser beam and an entire portion of a plurality of second beam spots formed on the surface of the processing object by the plurality of second laser beams are overlapped with each other.

20. (Original) A laser irradiation method according to claim 19,
wherein the first laser beam has a wavelength of second harmonic.

21. (Canceled)

22. (Previously Presented) A laser irradiation method according to claim 19,
wherein the first beam spot formed on the surface of the processing object by the first laser beam is elliptical, rectangular, or linear.

23. (Previously Presented) A laser irradiation method according to claim 19,

wherein the second beam spot formed on the surface of the processing object by the second laser beam is elliptical, rectangular, or linear.

24. (Original) A laser irradiation method according to claim 19, wherein the first laser beam is emitted from a laser oscillator selected from the group consisting of an Ar laser, a Kr laser, an excimer laser, a CO₂ laser, a YAG laser, a Y₂O₃ laser, a YVO₄ laser, a YLF laser, a YAlO₃ laser, a glass laser, a ruby laser, an alexandrite laser, a Ti: sapphire laser, a copper vapor laser, and a gold vapor laser.

25. (Previously Presented) A laser irradiation method according to claim 19, wherein the second laser beam is emitted from a laser oscillator selected from the group consisting of a YAG laser, a Y₂O₃ laser, a YVO₄ laser, a YLF laser, a YAlO₃ laser, an alexandrite laser, and a Ti: sapphire laser.

26. (Previously Presented) A laser irradiation method according to claim 19, wherein:
the processing object comprises a substrate having a thickness of "d" which is transparent to the first laser beam; and
an incident angle " $\Phi 1$ " of the first laser beam to the surface of the processing object satisfies an inequality of $\Phi 1 \geq \arctan (W1/2d)$ when W1 is defined as a length of a major axis or a minor axis of the first beam spot formed on the surface of the processing object by the first laser beam.

27. (Previously Presented) A laser irradiation method according to claim 19, wherein:
the processing object comprises a substrate having a thickness of "d" which is transparent to the second laser beam; and

an incident angle " Φ_2 " of the second laser beam to the surface of the processing object satisfies an inequality of $\Phi_2 \geq \arctan(W_2/2d)$ when W_2 is defined as a length of a major axis or a minor axis of the second beam spot formed on the surface of the processing object by the second laser beam.

28. (Previously Presented) A laser irradiation method comprising the step of:
irradiating a processing object with a first pulsed laser beam having a wavelength of visible light or a shorter wavelength than that of visible light and a second continuous wave laser beam of a solid laser, the second continuous wave laser beam has a fundamental wave,

wherein when the first laser beam and the second laser beam are irradiated, a beam spot formed on a surface of the processing object by the first laser beam and a beam spot formed on the surface of the processing object by the second laser beam are overlapped, and

wherein the beam spot of the first laser beam is larger than that of the second laser beam.

29. (Original) A laser irradiation method according to claim 28,
wherein the first laser beam has a wavelength of second harmonic.

30. (Canceled)

31. (Original) A laser irradiation method according to claim 28,
wherein the beam spot formed on the surface of the processing object by the first laser beam is elliptical, rectangular, or linear.

32. (Original) A laser irradiation method according to claim 28,

wherein the beam spot formed on the surface of the processing object by the second laser beam is elliptical, rectangular, or linear:

33. (Original) A laser irradiation method according to claim 28,
wherein the first laser beam is emitted from a laser oscillator selected from the group consisting of an Ar laser, a Kr laser, an excimer laser, a CO₂ laser, a YAG laser, a Y₂O₃ laser, a YVO₄ laser, a YLF laser, a YAlO₃ laser, a glass laser, a ruby laser, an alexandrite laser, a Ti: sapphire laser, a copper vapor laser, and a gold vapor laser.

34. (Previously Presented) A laser irradiation method according to claim 28,
wherein the second laser beam is emitted from a laser oscillator selected from the group consisting of a YAG laser, a Y₂O₃ laser, a YVO₄ laser, a YLF laser, a YAlO₃ laser, an alexandrite laser, and a Ti: sapphire laser.

35. (Original) A laser irradiation method according to claim 28,
wherein:
the processing object comprises a substrate having a thickness of "d" which is transparent to the first laser beam; and
an incident angle " Φ_1 " of the first laser beam to the surface of the processing object satisfies an inequality of $\Phi_1 \geq \arctan(W_1/2d)$ when W₁ is defined as a length of a major axis or a minor axis of the beam spot formed on the surface of the processing object by the first laser beam.

36. (Original) A laser irradiation method according to claim 28,
wherein:
the processing object comprises a substrate having a thickness of "d" which is transparent to the second laser beam; and

an incident angle " Φ_2 " of the second laser beam to the surface of the processing object satisfies an inequality of $\Phi_2 \geq \arctan(W_2/2d)$ when W_2 is defined as a length of a major axis or a minor axis of the beam spot formed on the surface of the processing object by the second laser beam.

37. (Previously Presented) A method for manufacturing a semiconductor device comprising the steps of:

forming a semiconductor film on an insulating surface; and

irradiating the semiconductor film with a first pulsed laser beam having a wavelength of visible light or a shorter wavelength than that of visible light and a plurality of second continuous wave laser beams of solid lasers, each of the plurality of second continuous wave laser beams has a fundamental wave to crystallize the semiconductor film,

wherein when the semiconductor film is irradiated with the first laser beam and the plurality of second laser beams, a portion of a first beam spot formed on a surface of the semiconductor film by the first laser beam and an entire portion of a plurality of second beam spots formed on the surface of the semiconductor film by the plurality of second laser beams are overlapped with each other.

38. (Original) A method for manufacturing a semiconductor device according to claim 37,

wherein the first laser beam has a wavelength of second harmonic.

39. (Canceled)

40. (Previously Presented) A method for manufacturing a semiconductor device according to claim 37,

wherein the first beam spot formed on the surface of the semiconductor film by the first laser beam is elliptical, rectangular, or linear.

41. (Previously Presented) A method for manufacturing a semiconductor device according to claim 37,

wherein the second beam spot formed on the surface of the semiconductor film by the second laser beam is elliptical, rectangular or linear.

42. (Previously Presented) A method for manufacturing a semiconductor device according to claim 37,

wherein the first laser beam is emitted from a laser oscillator selected from the group consisting of an Ar laser, a Kr laser, an excimer laser, a CO₂ laser, a YAG laser, a Y₂O₃ laser, a YVO₄ laser, a YLF laser, a YAlO₃ laser, a glass laser, a ruby laser, an alexandrite laser, a Ti: sapphire laser, a copper vapor laser, and a gold vapor laser.

43. (Previously Presented) A method for manufacturing a semiconductor device according to claim 37,

wherein the second laser beam is emitted from a laser oscillator selected from the group consisting of a YAG laser, a Y₂O₃ laser, a YVO₄ laser, a YLF laser, a YAlO₃ laser, an alexandrite laser, and a Ti: sapphire laser.

44. (Previously Presented) A method for manufacturing a semiconductor device according to claim 37,

wherein:

the semiconductor film is formed over a substrate comprising the insulating surface and having a thickness of "d" which is transparent to the first laser beam; and

an incident angle " $\Phi 1$ " of the first laser beam to the surface of the semiconductor film satisfies an inequality of $\Phi 1 \geq \arctan (W1/2d)$ when W1 is defined as a length of a

major axis or a minor axis of the first beam spot formed on the surface of the semiconductor film by the first laser beam.

45. (Previously Presented) A method for manufacturing a semiconductor device according to claim 37,

wherein:

the semiconductor film is formed over a substrate comprising the insulating surface and having a thickness of "d" which is transparent to the second laser beam; and

an incident angle " Φ_2 " of the second laser beam to the surface of the semiconductor film satisfies an inequality of $\Phi_2 \geq \arctan(W_2/2d)$ when W_2 is defined as a length of a major axis or a minor axis of the second beam spot formed on the surface of the semiconductor film by the second laser beam.

46. (Previously Presented) A method for manufacturing a semiconductor device comprising the steps of:

forming a semiconductor film on an insulating surface; and

irradiating the semiconductor film with a first pulsed laser beam having a wavelength of visible light or a shorter wavelength than that of visible light and a second continuous wave laser beam of a solid laser, the second continuous wave laser beam has a fundamental wave to crystallize the semiconductor film,

wherein when the first laser beam and the second laser beam are irradiated, a beam spot formed on a surface of the semiconductor film by the first laser beam and a beam spot formed on the surface of the semiconductor film by the second laser beam are overlapped, and

wherein the beam spot of the first laser beam is larger than that of the second laser beam.

47. (Original) A method for manufacturing a semiconductor device according to claim 46,
wherein the first laser beam has a wavelength of second harmonic.

48. (Canceled)

49. (Original) A method for manufacturing a semiconductor device according to claim 46,
wherein the beam spot formed on the surface of the semiconductor film by the first laser beam is elliptical, rectangular, or linear.

50. (Original) A method for manufacturing a semiconductor device according to claim 46,
wherein the beam spot formed on the surface of the semiconductor film by the second laser beam is elliptical, rectangular or linear.

51. (Previously Presented) A method for manufacturing a semiconductor device according to claim 46,
wherein the first laser beam is emitted from a laser oscillator selected from the group consisting of an Ar laser, a Kr laser, an excimer laser, a CO₂ laser, a YAG laser, a Y₂O₃ laser, a YVO₄ laser, a YLF laser, a YAlO₃ laser, a glass laser, a ruby laser, an alexandrite laser, a Ti: sapphire laser, a copper vapor laser, and a gold vapor laser.

52. (Previously Presented) A method for manufacturing a semiconductor device according to claim 46,
wherein the second laser beam is emitted from a laser oscillator selected from the group consisting of a YAG laser, a Y₂O₃ laser, a YVO₄ laser, a YLF laser, a YAlO₃ laser, an alexandrite laser, and a Ti: sapphire laser.

53. (Previously Presented) A method for manufacturing a semiconductor device according to claim 46,

wherein:

the semiconductor film is formed over a substrate comprising the insulating surface and having a thickness of "d" which is transparent to the first laser beam; and

an incident angle " $\Phi 1$ " of the first laser beam to the surface of the semiconductor film satisfies an inequality of $\Phi 1 \geq \arctan (W1/2d)$ when W1 is defined as a length of a major axis or a minor axis of the beam spot formed on the surface of the semiconductor film by the first laser beam.

54. (Previously Presented) A method for manufacturing a semiconductor device according to claim 46,

wherein:

the semiconductor film is formed over a substrate comprising the insulating surface and having a thickness of "d" which is transparent to the second laser beam; and

an incident angle " $\Phi 2$ " of the second laser beam to the surface of the semiconductor film satisfies an inequality of $\Phi 2 \geq \arctan (W2/2d)$ when W2 is defined as a length of a major axis or a minor axis of the beam spot formed on the surface of the semiconductor film by the second laser beam.